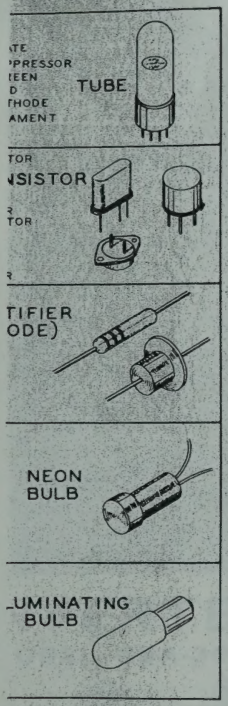
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CONDENSED

Assembly and Operation of the

HEATHKIT

6-METER CONVERTER

MODEL SBA-300-3

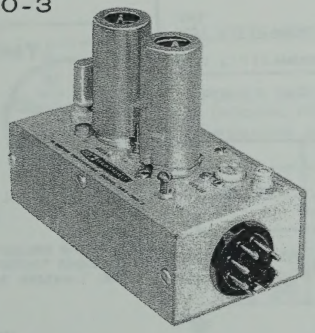


TABLE OF CONTENTS

Specifications. 2
Introduction. 3
Circuit Description. 4
Construction Notes. 5
Parts List. 6
Proper Soldering Techniques 8
Step-By-Step Procedure. 10

Step-By-Step Assembly -
Chassis Parts Mounting. 11
Wiring. 13
Cable Preparation. 18

Initial Test And Adjustment 20
Installation. 21
Operation. 23
Instrument Alignment. 25
Instrument Alignment Chart. 26
In Case Of Difficulty. 27

Factory Repair Service. 28
Replacement Parts Price List. 29
Schematic. . . .(fold-out from page). 31

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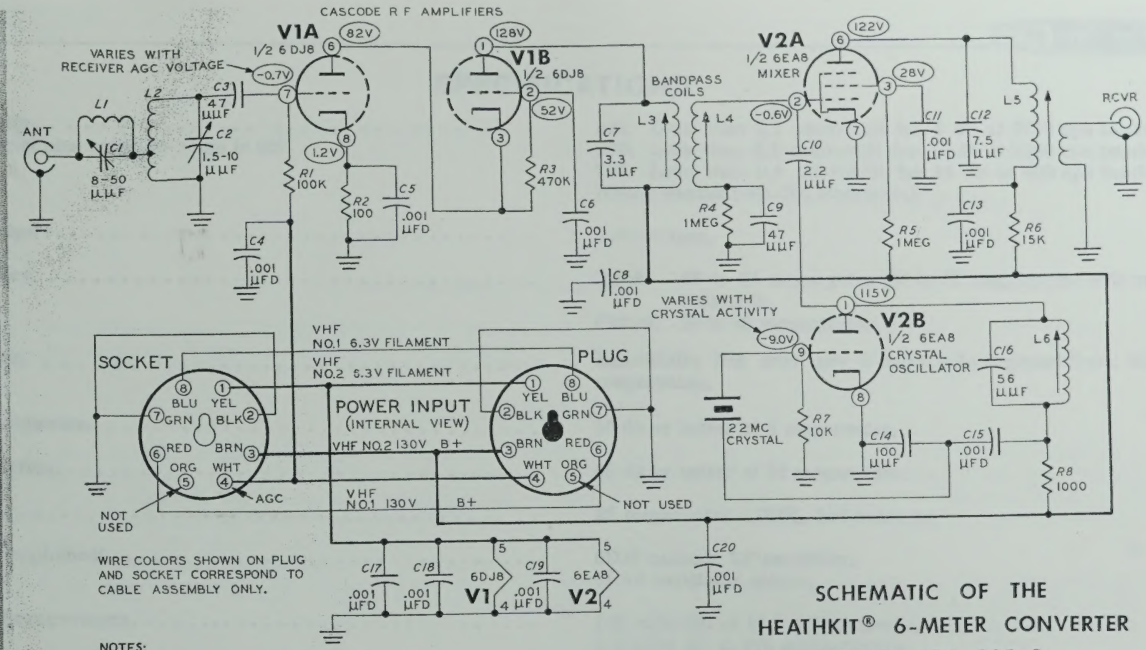
ANUAL

HEATHKIT

NVERTER

ODEL SBA-300-3

595-706
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WIRE COLORS SHOWN ON PLUG AND SOCKET CORRESPOND TO CABLE ASSEMBLY ONLY.

SCHEMATIC OF THE
HEATHKIT® 6-METER CONVERTER
MODEL SBA-300-3

NOTES:

ALL RESISTORS ARE 1/2 WATT.
ALL RESISTOR VALUES ARE IN OHMS (K = 1000, MEG = 1,000,000).
⬭ INDICATES VOLTAGE READING.
ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.
ALL VOLTAGES ARE MEASURED FROM POINT INDICATED TO CHASSIS GROUND AND MAY VARY ±10%.
VOLTAGE READINGS TAKEN WITH AN 11 MEGOHM INPUT VTVM, WITH NO SIGNAL INPUT.
POWER INPUT LINES LABLED VHF NO. 2 RECEIVE POWER WHEN SB-300 RECEIVER
CONVERTER SWITCH IS IN VHF NO. 2 POSITION.
POWER INPUT LINES LABLED VHF NO. 1 RECEIVE POWER WHEN SB-300 RECEIVER
CONVERTER SWITCH IS IN VHF NO. 1 POSITION.

SPECIFICATIONS

Sensitivity. (Signal plus noise-to-noise in db)	AM: Less than 0.1 microvolt for 6 db at 3750 cps bandwidth. SSB: Less than 0.1 microvolt for 10 db at 2100 cps bandwidth. CW: Less than 0.1 microvolt for 15 db at 400 cps bandwidth. (Using Heathkit SB-300 Receiver.)
Noise Figure.	5 db or less.
Frequency.	Input: 48 to 54 megacycles (50 to 52 megacycles with crystal supplied). Output: 28 to 30 megacycles.
Bandpass.	Essentially flat over any 2 megacycle segment from 48 to 54 megacycles.
Image Rejection.	50 db or better at 6 megacycles.
IF Rejection.	40 db or better at 28 megacycles.
Crystal.	22 megacycles ±.005%, 3rd overtone.
Tube Complement.	6DJ8 cascode RF amplifier. 6EA8 oscillator-mixer.
Power Requirements.	130 volts DC at 12.5 milliamperes. 6.3 volts AC at 815 milliamperes.
Dimensions.	Overall: 2-5/8" wide x 5-3/4" long x 3-3/4" high.

Net Weight	10-1/2 oz.
Test Equipment Used In Preparing Specifications, Measurements, And Alignment Instructions	Measurements Corporation Model 80 Standard Signal Generator (with 50 Ω pad). Heathkit Model IM-13 Vacuum Tube Voltmeter.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

INTRODUCTION

The Heathkit Model SBA-300-3, 6-Meter Converter is designed to extend the frequency coverage of the Heathkit SB-300 Receiver to include 48 to 54 megacycles (50 to 52 megacycles with the 22 megacycle crystal supplied). The Converter receives its filament, B+, and AGC voltages from the receiver through a power cable. The power cable and the antenna connections for the Converter are switched by the converter switch in the SB-300 Receiver.

A separate power socket on the Converter chassis provides power for the Heathkit Model SBA-300-4, 2-Meter Converter. Either one or both of these converters, can be mounted on the rear of the SB-300 Receiver cabinet for a neat, easy installation.

The Converter circuit consists of a cascode RF amplifier, a crystal-controlled oscillator, and a mixer stage. The 2-stage RF amplifier provides low noise, plus excellent sensitivity characteristics; the crystal-controlled oscillator provides drift-free mixer injection.

Although this Converter is designed for use with the Heathkit SB-300 Receiver, it can be used equally well with any other receiver that has similar characteristics and tunes from 28 to 30 megacycles.

The SBA-300-3 Converter and SB-300 Receiver combination provides high-sensitivity, high-stability, and low-noise VHF reception of AM, SSB, and CW signals in the 6-meter band.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-out from Page 31) while reading the following Circuit Description.

CASCODE RF AMPLIFIER

Tube stages V1A and V1B are connected as an untuned cascode RF amplifier; V1A is a grounded-cathode stage, and V1B is a grounded-grid stage. The signal from the antenna is coupled across trap coil L1, input coil L2 and through coupling capacitor C3 to the grid of tube V1A. Capacitor C1 is adjusted to trap out signals at 59.75 megacycles, while allowing the desired frequencies to pass. Input coil L2 is tapped to provide a 50 Ω antenna input impedance.

In tube V1A, the signal is amplified and then applied to the cathode of tube V1B. After further amplification in V1B, the signal is coupled through bandpass coils L3 and L4. These coils are placed physically close together so they operate as a transformer; L3 serves as the primary and L4 as the secondary of the transformer. This circuit presents a high impedance to 48-54 megacycle signal frequencies, and is almost a short circuit to any other received signal frequencies that may be amplified by the cascode RF amplifier.

MIXER-OSCILLATOR

The signal from coil L4 is directly coupled to the grid of tube V2A, which is used as a low-noise mixer. The oscillator signal from V2B is also applied to the grid of mixer V2A. The ir coming signal frequency and the oscillator frequency are mixe in V2A to produce an IF signal (28 to 30 megacycles). Th plate circuit of V2A is tuned to the 29 megacycle IF midpoir by capacitor C12 and coil L5. The IF signal is connected fro coil L5 to the receiver antenna input. A link winding on coil L provides a 50 Ω output impedance to match the receiver an tenna input impedance.

Tube V2B is a crystal-controlled oscillator stage. A 22 meg acycle, 3rd overtone crystal is used in the grid circuit. The plat circuit is tuned by coil L6 and capacitor C16. The 22 mega cycle oscillator signal is coupled through capacitor C10 to th grid of mixer tube V2A. (The 22 megacycle crystal provide coverage between 50 and 52 megacycles. A 20, 21, 23, or 2 megacycle crystal may also be used to cover 2 megacycl segments below and above the 50 to 52 megacycle range.

POWER

Filament, B+, and AGC voltages are provided by the receive through a cable assembly. The VHF No. 2 position of th SB-300 Receiver Converter switch applies power to the Con verter through lugs 1 and 3 of the plug and socket. In the VHF No. 1 position, power is applied through lugs 6 and 8 of the octa plug and socket for use with a 2-Meter Converter. AGC voltage is applied through lug 4 and is not switched.

PARTS LIST

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial to aid in parts identification.

To order replacement parts, refer to the Replacement Par Price List and use the Parts Order Form furnished with th kit.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS-1/2 WATT		
(1) 1-3	1	100 Ω (brown-black-brown)
1-9	1	1000 Ω (brown-black-red)
1-20	1	10 KΩ (brown-black-orange)
1-21	1	15 KΩ (brown-green-orange)
1-26	1	100 KΩ (brown-black-yellow)
1-33	1	470 KΩ (yellow-violet-yellow)
1-35	2	1 megohm (brown-black-green)
CAPACITORS		
(2) 20-52	1	7.5 μμf mica
20-78	1	56 μμf mica
(3) 21-33	1	3.3 μμf disc
21-32	2	47 μμf disc
21-9	1	100 μμf disc
21-14	10	.001 μfd disc
(4) 28-1	1	2.2 μμf tubular (red-red-white)
(5) 31-21	1	1.5-10 μμf ceramic trimmer
31-27	1	8-50 μμf trimmer

PART No.	PARTS Per Kit	DESCRIPTION
COILS		
(6) 40-342	2	Bandpass
(7) 40-343	1	RF
(8) 40-622	1	Oscillator
40-623	1	Output
40-209	1	Trap coil
HARDWARE		
SCREWS		
(9) 250-170	6	#6 x 1/4" sheet metal
(10) 250-49	7	3-48 x 1/4"
(11) 250-133	1	3-48 x 7/16"
(12) 250-89	2	6-32 x 3/8"
(13) 250-134	1	6-32 x 3/4"
NUTS		
(14) 252-1	8	3-48
(15) 252-3	2	6-32
(16) 252-19	1	6-32 palnut

PART No.	PARTS Per Kit	DESCRIPTION
LOCKWASHERS		
(17) 254-7	13	#3
(18) 254-1	2	#6
(19) 254-14	2	1/4"
MISCELLANEOUS HARDWARE		
(20) 259-6	4	#6 solder lug
(21) 260-29	1	Crystal clip
(22) 435-1	2	Mounting ring
WIRE-CABLES		
344-59	1	Hookup wire
347-1	1	8-wire cable
343-2	1	Shielded cable
CRYSTAL-TUBES		
404-249	1	22 mc crystal
411-124	1	6EA8 tube
411-208	1	6DJ8 tube

PART No.	PARTS Per Kit	DESCRIPTION
TERMINAL STRIP-SOCKETS-PLUGS		
431-49	1	11-lug terminal strip
(23) 434-4	2	Octal socket
(24) 434-36	2	9-pin tube socket
(25) 434-74	1	Crystal socket
(26) 434-107	2	Phono socket
(27) 438-4	3	Phono plug
(28) 438-6	2	Octal plug
MISCELLANEOUS		
206-3	2	Tube shield
261-4	4	Rubber foot
200-420-1	1	Chassis
201-32	1	Chassis base
(29) 440-1	2	Octal plug cap
490-1	1	Alignment tool
	1	Manual (See front cover for part number.)
		Solder

Refer to Pictorial 5 for the following steps.

() Locate the length of 8-wire cable and prepare each end as shown in the Pictorial.

() Remove 1/4" of insulation from the end of each inner wire and apply a small amount of solder to the bared ends. This will hold the small wire strands together.

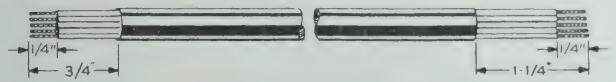
() Place an octal cap over each cable end, then connect the wires at each end of the cable to the octal socket and plug as shown.

() Check all the connections at each end of the cable. Be sure none of them are shorted out due to solder splashes.

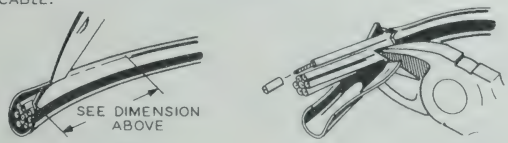
() Snap the caps onto the octal plug and socket.

() If an ohmmeter is available, check this cable to see that none of the leads are shorted together and that socket lugs are not shorted to the socket cap.

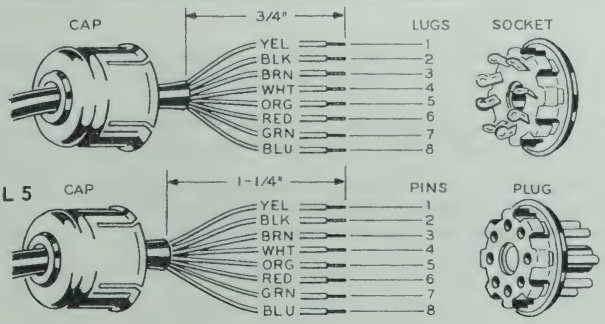
() Set this cable aside to be used later.



TAKING CARE NOT TO CUT THE INNER LEADS REMOVE THE OUTER INSULATION OF THE CABLE.



REMOVE 1/4" OF INSULATION FROM THE END OF EACH INNER LEAD. APPLY A SMALL AMOUNT OF SOLDER TO THE BARED WIRE ENDS. THEN CONNECT THE LONGER LEADS TO THE OCTAL PLUG AND THE SHORTER LEADS TO THE OCTAL SOCKET AS FOLLOWS.



PICTORIAL 5

INITIAL TEST AND ADJUSTMENT

NOTE: This Converter was designed for use with the Heathkit SB-300 Receiver, but it can also be used with other receivers that tune the 10 meter band, and provide suitable filament, B+, and AGC voltages. These voltages should be connected to the octal plug of the power cable as follows:

Pin 1 - Filament, 6.3 volts at 815 milliamperes.
Pin 2 - Ground.
Pin 3 - B+, 130 volts at 12.5 milliamperes.
Pin 4 - AGC.
Pin 7 - Ground.

The following adjustments are made with the Converter connected to a Heathkit SB-300 Receiver that is operating, and properly aligned. An 11 megohm input VTVM will be needed for some of these adjustments.

() Set the SB-300 Receiver front panel controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - STBY.
BAND - 28.5
AF GAIN - Fully counterclockwise.
RF GAIN - Fully clockwise.
SLIDE RULE DIAL - ON 1.
CIRCULAR DIAL - ON 0.

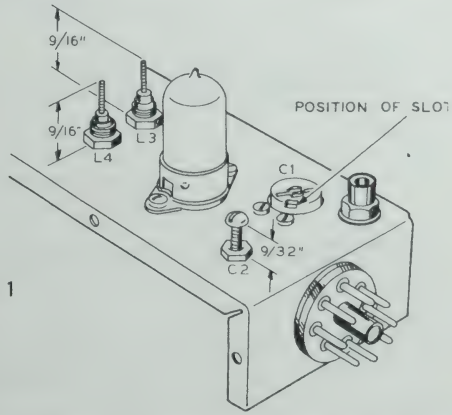


Figure 1

() Referring to Figure 1, preset coils L3 and L4, and capa itors C1 and C2 as shown.

() Connect the power cable prepared previously from the R ceiver socket to the Converter plug.

() Set the Receiver Converter switch to VHF No. 2. With t Converter switch in this position, filament and B+ voltag are applied to the Converter. The filaments of the Convert tubes should light.

() If there is any sign of overheating components, turn the Receiver Converter switch to the HF position to remove filament and B+ voltages from the Converter. If no difficulty is encountered, proceed with the following steps.

() Install the tube shields over the Converter tubes.

() Set the Receiver Function switch to OPR (operate).

() Set the VTVM to read -DC volts on the 5 volt or higher range.

() Connect the DC probe of the VTVM to lug 2 of coil F, and connect the common VTVM lead to the Converter chassis.

() Using the alignment tool supplied, adjust oscillator coil L6 for a maximum VTVM reading.

() Disconnect the VTVM test leads from the Converter.

() Using the alignment tool supplied, adjust output coil L5 and the receiver preselector for maximum noise in the speaker.

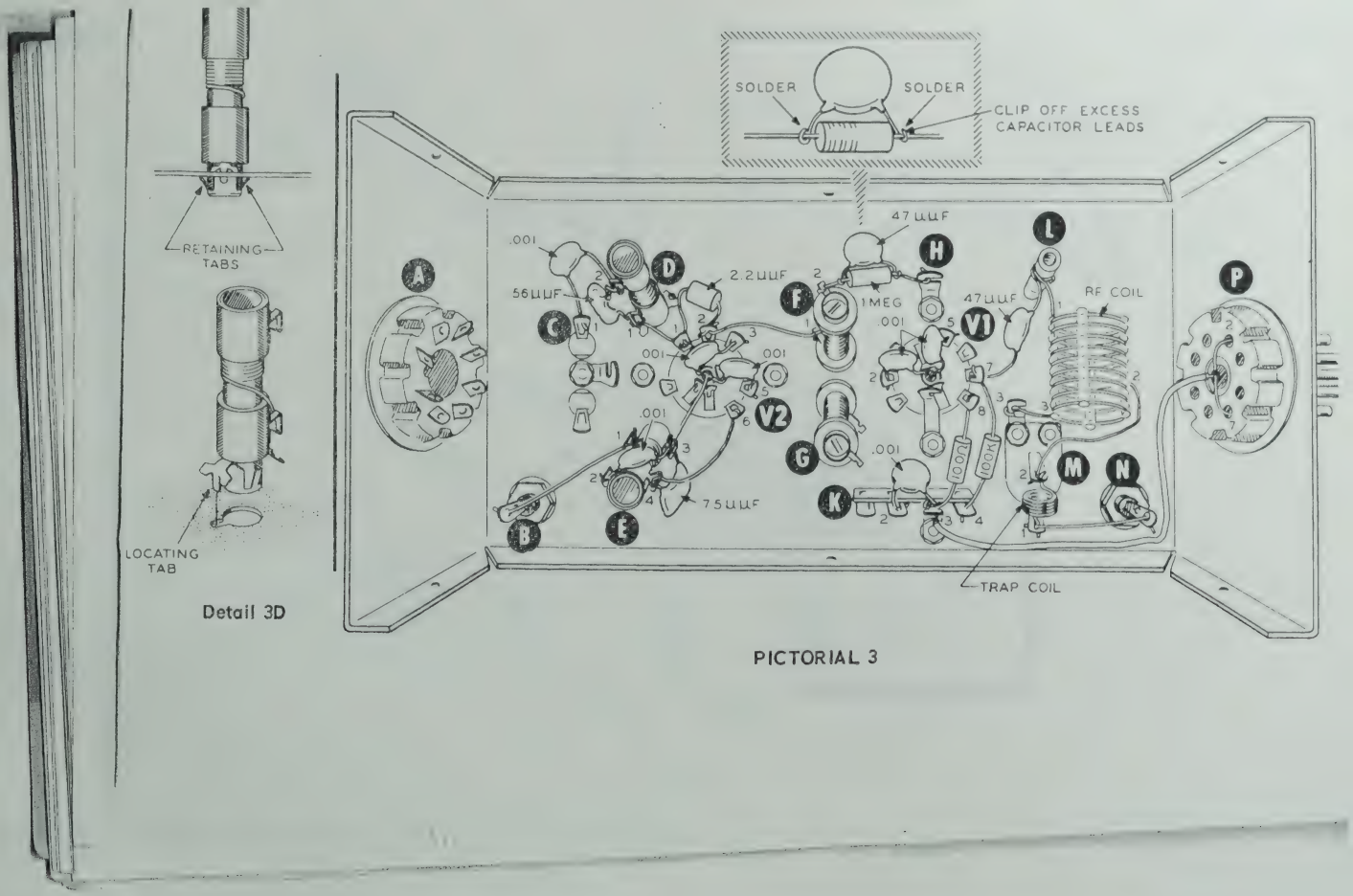
() Set the Receiver Function switch to OFF.

() Disconnect the Converter power cable from the Receiver socket.

This completes the Initial Test And Adjustment of the Converter. Proceed with the Installation section.

INSTALLATION

NOTE: Permanent and Alternate Mounting instructions are given. Use the permanent mounting section if you prefer to have the Converter attached to the rear of your SB-300 Receiver; if you do not want the Converter attached to the Receiver, use the Alternate Mounting section.

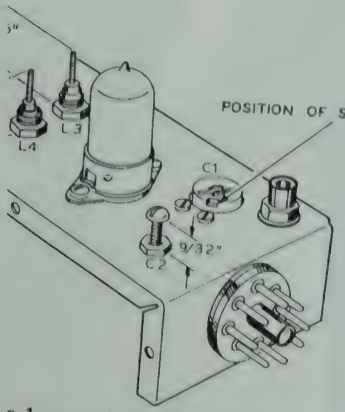


Detail 3D

PICTORIAL 3

HEATHKIT

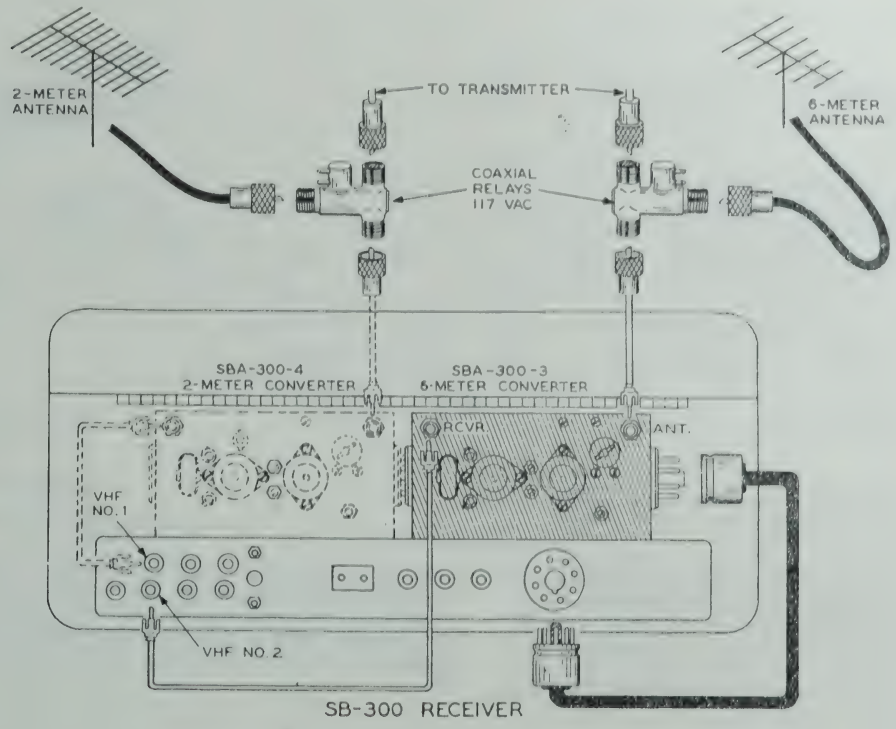
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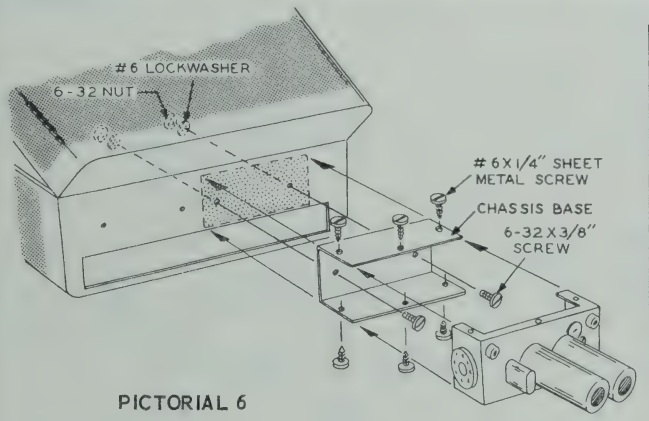
e 1, preset coils L3 and L4, and capac- shown.

cable prepared previously from the Re- Converter plug.

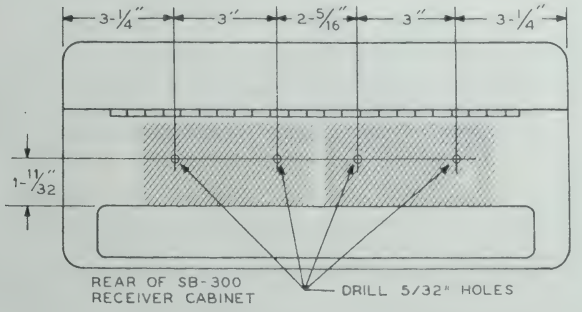
onverter switch to VHF No. 2. With the this position, filament and B+ voltages onverter. The filaments of the Converter



PICTORIAL 8



PICTORIAL 6



Detail 6A

PERMANENT MOUNTING

Refer to Pictorial 6 for the following steps.

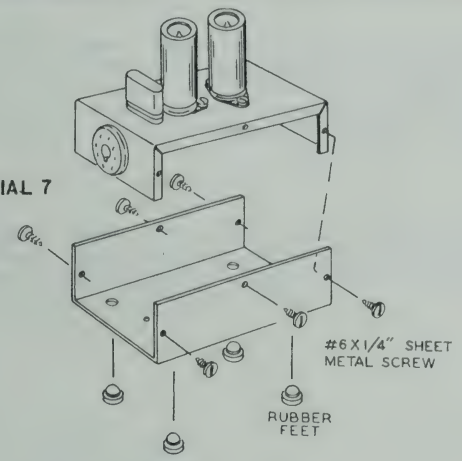
NOTE: Some early model SB-300 Receiver Cabinets do not have holes in the back of the cabinet for the Converter installation. If your cabinet does not have these holes, use Detail 6A to locate and drill the holes needed for the Converter mounting. Be sure to remove the receiver from the cabinet before drilling the holes.

() Install the chassis base to the rear of the receiver cabinet. Use two 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

() Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

() Install the Receiver chassis into the cabinet.

PICTORIAL 7



ALTERNATE MOUNTING

Refer to Pictorial 7 for the following steps.

() Install the four rubber feet to the bottom of the chassis base.

() Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

CABLE HOOKUP

Refer to Pictorial 8 for the following steps.

() Connect the power cable from the Converter to the Receiver socket.

() Connect the prepared shielded cable from the RCVR socket of the Converter to the VHF No. 2 socket of the SB-300 Receiver.

() Connect your 6-meter antenna to the ANT socket of the Converter.

OPERATION

TRAP ADJUSTMENT

() Set the SB-300 band switch to 28.0 and tune the receiver to 28.25 (50.25) megacycles. If a spurious signal is heard at or near this frequency (this would be the sound carrier of a channel 2 television station near your locality) turn trap adjustment C1 for minimum signal leakthrough.

ANTENNA TRIMMER ADJUSTMENT

() Adjust trimmer capacitor C2 for the best signal-to-noise ratio when tuned to a weak 6-meter signal.

Instrument alignment should not be required, as the previous adjustments of the coils and capacitors should provide Converter operation equal to, or better than the specifications. In case you have the necessary equipment, and prefer instrument alignment, refer to Pages 25 and 26 of this Manual.

Pictorial 8 shows all the cable connections for using the SBA-300-3, 6-Meter Converter with the SB-300 Receiver. Connections for the SBA-300-4, 2-Meter Converter (available as a separate kit) are shown by dotted lines.

CRYSTAL INFORMATION

The 22 megacycle crystal supplied with the Converter provides reception from 50 to 52 megacycles. Other crystal frequencies can be used to cover different 2-megacycle segments between 48 and 54 megacycles. The following chart lists some of the crystal frequencies that can be used. In each case, the output frequency of the Converter is between 28 and 30 mc, which corresponds to 10 meter reception with the SB-300 Receiver.

CRYSTAL CHART
(Frequencies in megacycles)

CONVERTER CRYSTAL	COVERAGE
20	48 to 50
21	49 to 51
22	50 to 52
23	51 to 53
24	52 to 54

When purchasing a crystal for use with this Converter, you should specify the frequency and the following crystal characteristics. Crystals that do not have these characteristics will not provide optimum performance.

Holder HC-6/U:	Pin diameter .050". Pin spacing .486".
Load capacitance (C1):	12.8 $\mu\mu$f.
Internal capacity (Co):	6 $\mu\mu$f, maximum.
Series resistance (Rs):	30 Ω, maximum.
Drive level:	8 milliwatts.

Also, if you install a crystal other than the 22 megacycle crystal supplied, it will be necessary to readjust oscillator coil L6 as directed in the Test And Adjustment section of the manual.

INSTRUMENT ALIGNMENT

Instrument alignment of the Converter is not required for normal operation; however, if you have access to the necessary test equipment, complete instrument alignment will assure optimum performance. A signal generator that covers 48 to 54 megacycles and a vacuum tube voltmeter will be needed.

() Connect the vacuum tube voltmeter to the speaker terminals of the Receiver. Set the vacuum tube voltmeter to the 1.5 volt AC range.

() Set the SB-300 Receiver controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - OPR.
RF GAIN - Fully clockwise.
Slide rule dial - 1.
Circular dial - 0.
Converter switch - VHF No. 2.

() Unplug the antenna and connect the signal generator output to the Converter ANT socket.

() Set the signal generator for 30% modulation, and keep the signal output level at 1 microvolt during alignment.

Now align the Converter as directed in the Instrument Alignment Chart on Page 26.

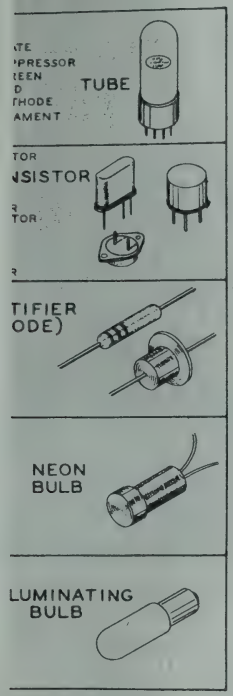
NOTE: The signal generator frequencies given in the Instrument Alignment Chart are for use with a 22 megacycle crystal in the Converter. If you have a different frequency crystal in the Converter, it will be necessary to change the signal generator frequencies accordingly.

For example: Step 1 in the Instrument Alignment Chart calls for a signal generator frequency of 51.1 megacycles. If you are using a 24 megacycle crystal, you should set the signal generator to 53.1 megacycles (+2 megacycles).

INSTRUMENT ALIGNMENT CHART

	SB-300 BAND	SB-300 AF GAIN	SB-300 PRE-SELECTOR	SIGNAL GENERATOR (400 cps with 30% modulation)	SB-300 CIRCULAR DIAL		CONVERTER ADJUSTMENTS			
						L5	L6	L3 AND L4	C1	C2
1	29.0 MC	1/2 OF ROTATION	MAXIMUM VTVM READING (NOISE)	51.1 MC	MAXIMUM VTVM READING	MAXIMUM VTVM READING	ADJUST L6 AND SB-300 CIRCULAR DIAL FOR MAXIMUM VTVM READING			
2	28.0 MC	1/2 OF ROTATION	MAXIMUM VTVM READING (NOISE)	50.1 MC	MAXIMUM VTVM READING			ADJUST L4 FOR MAXIMUM VTVM READING	REPEAT THESE TWO ADJUSTMENTS FOR MAXIMUM VTVM READINGS. THESE READINGS SHOULD NOT VARY MORE THAN 5 TO 6 DB BETWEEN THESE TWO FREQUENCY SETTINGS.	
3	29.5 MC	1/2 OF ROTATION	MAXIMUM VTVM READING (NOISE)	51.9 MC	MAXIMUM VTVM READING			ADJUST L3 FOR MAXIMUM VTVM READING		
4	28.0 MC	1/2 OF ROTATION	MAXIMUM VTVM READING (NOISE)	59.75 MC INCREASE SIGNAL GENERATOR OUTPUT	28.25 MC MAXIMUM VTVM READING				ADJUST FOR MINIMUM VTVM READING	
5	28.0 MC			DISCONNECT SIGNAL GENERATOR AND CONNECT ANTENNA	TUNE FOR ON-THE-AIR SIGNAL					ADJUST FOR BEST SIGNAL-TO-NOISE RATIO

entifying most parts and



Assembly and Operation of the

HEATHKIT

6-METER CONVERTER

MODEL SBA-300-3

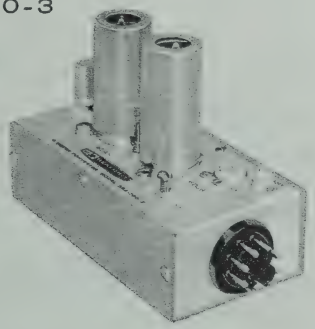


TABLE OF CONTENTS

Specifications 2
Introduction 3
Circuit Description 4
Construction Notes 5
Parts List 6
Proper Soldering Techniques 8
Step-By-Step Procedure 10

Step-By-Step Assembly -
- Chassis Parts Mounting 11
- Wiring 13
- Cable Preparation 18

Initial Test And Adjustment 20
Installation 21
Operation 23
Instrument Alignment 25
Instrument Alignment Chart 26
In Case Of Difficulty 27

Factory Repair Service 28
Replacement Parts Price List 29
Schematic (fold-out from page) 31

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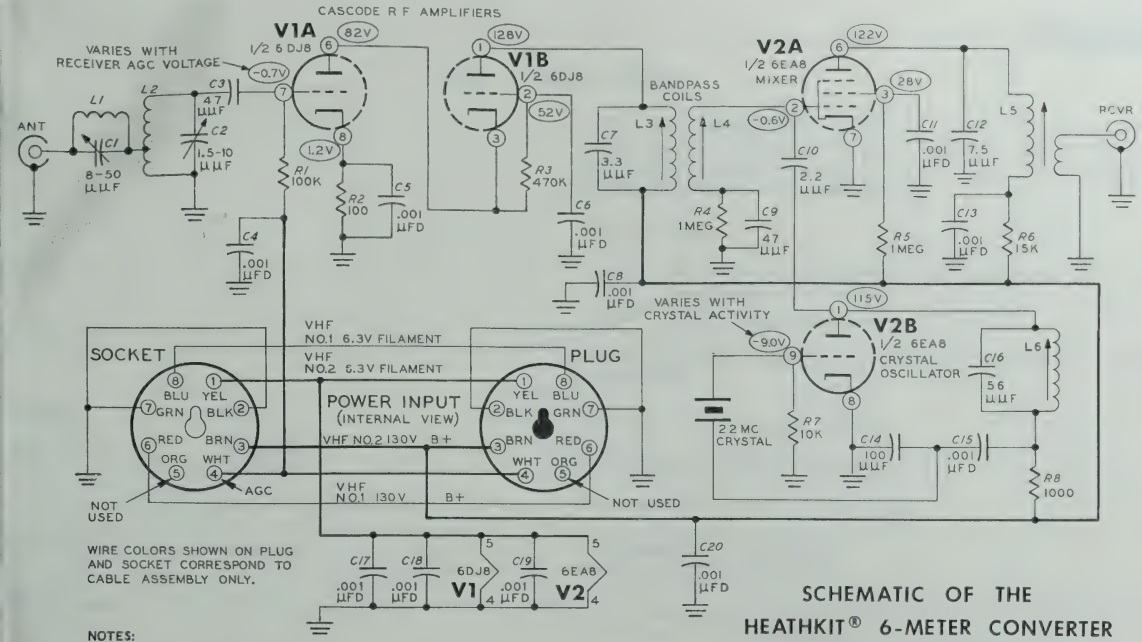
HEATHKIT

NVERTER

ODEL SBA-300-3

595-706

7-18-69



SCHEMATIC OF THE
HEATHKIT® 6-METER CONVERTER
MODEL SBA-300-3

NOTES:

ALL RESISTORS ARE 1/2 WATT.
ALL RESISTOR VALUES ARE IN OHMS (K = 1000, MEG = 1,000,000).
⬭ INDICATES VOLTAGE READING.
ALL VOLTAGES ARE DC POSITIVE UNLESS MARKED OTHERWISE.
ALL VOLTAGES ARE MEASURED FROM POINT INDICATED TO CHASSIS GROUND AND MAY VARY ±10%.
VOLTAGE READINGS TAKEN WITH AN 11 MEGOHM INPUT VTVM, WITH NO SIGNAL INPUT.
POWER INPUT LINES LABLED VHF NO. 2 RECEIVE POWER WHEN SB-300 RECEIVER
CONVERTER SWITCH IS IN VHF NO. 2 POSITION.
POWER INPUT LINES LABLED VHF NO. 1 RECEIVE POWER WHEN SB-300 RECEIVER
CONVERTER SWITCH IS IN VHF NO. 1 POSITION.

SPECIFICATIONS

Sensitivity. (Signal plus noise-to-noise in db)	AM: Less than 0.1 microvolt for 6 db at 3750 cps bandwidth. SSB: Less than 0.1 microvolt for 10 db at 2100 cps bandwidth. CW: Less than 0.1 microvolt for 15 db at 400 cps bandwidth. (Using Heathkit SB-300 Receiver.)
Noise Figure.	5 db or less.
Frequency.	Input: 48 to 54 megacycles (50 to 52 megacycles with crystal supplied). Output: 28 to 30 megacycles.
Bandpass.	Essentially flat over any 2 megacycle segment from 48 to 54 megacycles.
Image Rejection.	50 db or better at 6 megacycles.
IF Rejection.	40 db or better at 28 megacycles.
Crystal.	22 megacycles ±.005%, 3rd overtone.
Tube Complement.	6DJ8 cascode RF amplifier. 6EA8 oscillator-mixer.
Power Requirements.	130 volts DC at 12.5 milliamperes. 6.3 volts AC at 815 milliamperes.
Dimensions.	Overall: 2-5/8" wide x 5-3/4" long x 3-3/4" high.

Net Weight	10-1/2 oz.
Test Equipment Used In Preparing Specifications, Measurements, And Alignment Instructions	Measurements Corporation Model 80 Standard Signal Generator (with 50 Ω pad). Heathkit Model IM-13 Vacuum Tube Voltmeter.

The Heath Company reserves the right to discontinue instruments and to change specifications at any time without incurring any obligation to incorporate new features in instruments previously sold.

INTRODUCTION

The Heathkit Model SBA-300-3, 6-Meter Converter is designed to extend the frequency coverage of the Heathkit SB-300 Receiver to include 48 to 54 megacycles (50 to 52 megacycles with the 22 megacycle crystal supplied). The Converter receives its filament, B+, and AGC voltages from the receiver through a power cable. The power cable and the antenna connections for the Converter are switched by the converter switch in the SB-300 Receiver.

A separate power socket on the Converter chassis provides power for the Heathkit Model SBA-300-4, 2-Meter Converter. Either one or both of these converters, can be mounted on the rear of the SB-300 Receiver cabinet for a neat, easy installation.

The Converter circuit consists of a cascode RF amplifier, a crystal-controlled oscillator, and a mixer stage. The 2-stage RF amplifier provides low noise, plus excellent sensitivity characteristics; the crystal-controlled oscillator provides drift-free mixer injection.

Although this Converter is designed for use with the Heathkit SB-300 Receiver, it can be used equally well with any other receiver that has similar characteristics and tunes from 28 to 30 megacycles.

The SBA-300-3 Converter and SB-300 Receiver combination provides high-sensitivity, high-stability, and low-noise VHF reception of AM, SSB, and CW signals in the 6-meter band.

CIRCUIT DESCRIPTION

Refer to the Schematic Diagram (fold-out from Page 31) while reading the following Circuit Description.

CASCODE RF AMPLIFIER

Tube stages V1A and V1B are connected as an untuned cascode RF amplifier; V1A is a grounded-cathode stage, and V1B is a grounded-grid stage. The signal from the antenna is coupled across trap coil L1, input coil L2 and through coupling capacitor C3 to the grid of tube V1A. Capacitor C1 is adjusted to trap out signals at 59.75 megacycles, while allowing the desired frequencies to pass. Input coil L2 is tapped to provide a 50 Ω antenna input impedance.

In tube V1A, the signal is amplified and then applied to the cathode of tube V1B. After further amplification in V1B, the signal is coupled through bandpass coils L3 and L4. These coils are placed physically close together so they operate as a transformer; L3 serves as the primary and L4 as the secondary of the transformer. This circuit presents a high impedance to 48-54 megacycle signal frequencies, and is almost a short circuit to any other received signal frequencies that may be amplified by the cascode RF amplifier.

MIXER-OSCILLATOR

The signal from coil L4 is directly coupled to the grid of tube V2A, which is used as a low-noise mixer. The oscillator signal from V2B is also applied to the grid of mixer V2A. The incoming signal frequency and the oscillator frequency are mixed in V2A to produce an IF signal (28 to 30 megacycles). The plate circuit of V2A is tuned to the 29 megacycle IF midpoint by capacitor C12 and coil L5. The IF signal is connected from coil L5 to the receiver antenna input. A link winding on coil L5 provides a 50 Ω output impedance to match the receiver antenna input impedance.

Tube V2B is a crystal-controlled oscillator stage. A 22 megacycle, 3rd overtone crystal is used in the grid circuit. The plate circuit is tuned by coil L6 and capacitor C16. The 22 megacycle oscillator signal is coupled through capacitor C10 to the grid of mixer tube V2A. (The 22 megacycle crystal provides coverage between 50 and 52 megacycles. A 20, 21, 23, or 24 megacycle crystal may also be used to cover 2 megacycle segments below and above the 50 to 52 megacycle range.)

POWER

Filament, B+, and AGC voltages are provided by the receiver through a cable assembly. The VHF No. 2 position of the SB-300 Receiver Converter switch applies power to the Converter through lugs 1 and 3 of the plug and socket. In the VHF No. 1 position, power is applied through lugs 6 and 8 of the octal plug and socket for use with a 2-Meter Converter. AGC voltage is applied through lug 4 and is not switched.

PARTS LIST

The numbers in parentheses in the Parts List are keyed to the numbers on the Parts Pictorial to aid in parts identification.

To order replacement parts, refer to the Replacement Parts Price List and use the Parts Order Form furnished with this kit.

PART No.	PARTS Per Kit	DESCRIPTION
RESISTORS-1/2 WATT		
(1) 1-3	1	100 Ω (brown-black-brown)
1-9	1	1000 Ω (brown-black-red)
1-20	1	10 KΩ (brown-black-orange)
1-21	1	15 KΩ (brown-green-orange)
1-26	1	100 KΩ (brown-black-yellow)
1-33	1	470 KΩ (yellow-violet-yellow)
1-35	2	1 megohm (brown-black-green)
CAPACITORS		
(2) 20-52	1	7.5 μμf mica
20-78	1	56 μμf mica
(3) 21-33	1	3.3 μμf disc
21-32	2	47 μμf disc
21-9	1	100 μμf disc
21-14	10	.001 μfd disc
(4) 28-1	1	2.2 μμf tubular (red-red-white)
(5) 31-21	1	1.5-10 μμf ceramic trimmer
31-27	1	8-50 μμf trimmer
COILS		
(6) 40-342	2	Bandpass
(7) 40-343	1	RF
(8) 40-622	1	Oscillator
40-623	1	Output
40-209	1	Trap coil
HARDWARE		
SCREWS		
(9) 250-170	6	#6 x 1/4" sheet metal
(10) 250-49	7	3-48 x 1/4"
(11) 250-133	1	3-48 x 7/16"
(12) 250-89	2	6-32 x 3/8"
(13) 250-134	1	6-32 x 3/4"
NUTS		
(14) 252-1	8	3-48
(15) 252-3	2	6-32
(16) 252-19	1	6-32 palnut

PART No.	PARTS Per Kit	DESCRIPTION
LOCKWASHERS		
(17) 254-7	13	#3
(18) 254-1	2	#6
(19) 254-14	2	1/4"
MISCELLANEOUS HARDWARE		
(20) 259-6	4	#6 solder lug
(21) 260-29	1	Crystal clip
(22) 435-1	2	Mounting ring
WIRE-CABLES		
344-59	1	Hookup wire
347-1	1	8-wire cable
343-2	1	Shielded cable
CRYSTAL-TUBES		
404-249	1	22 mc crystal
411-124	1	6EA8 tube
411-208	1	6DJ8 tube

PART No.	PARTS Per Kit	DESCRIPTION
TERMINAL STRIP-SOCKETS-PLUGS		
431-49	1	11-lug terminal strip
(23) 434-4	2	Octal socket
(24) 434-36	2	9-pin tube socket
(25) 434-74	1	Crystal socket
(26) 434-107	2	Phono socket
(27) 438-4	3	Phono plug
(28) 438-6	2	Octal plug
MISCELLANEOUS		
206-3	2	Tube shield
261-4	4	Rubber foot
200-420-1	1	Chassis
201-32	1	Chassis base
(29) 440-1	2	Octal plug cap
490-1	1	Alignment tool
	1	Manual (See front cover for part number.)
		Solder

Refer to Pictorial 5 for the following steps.

() Locate the length of 8-wire cable and prepare each end as shown in the Pictorial.

() Remove 1/4" of insulation from the end of each inner wire and apply a small amount of solder to the bared ends. This will hold the small wire strands together.

() Place an octal cap over each cable end, then connect the wires at each end of the cable to the octal socket and plug as shown.

() Check all the connections at each end of the cable. Be sure none of them are shorted out due to solder splashes.

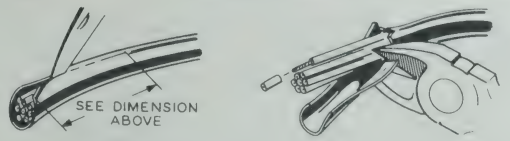
() Snap the caps onto the octal plug and socket.

() If an ohmmeter is available, check this cable to see that none of the leads are shorted together and that socket lugs are not shorted to the socket cap.

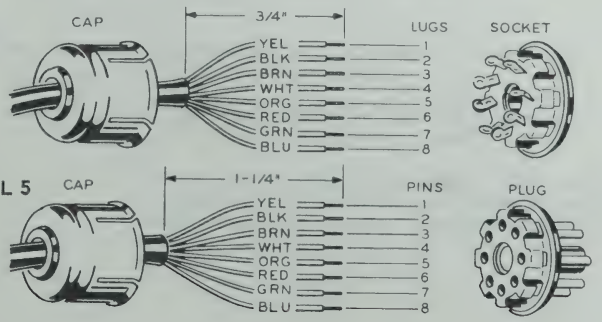
() Set this cable aside to be used later.



TAKING CARE NOT TO CUT THE INNER LEADS REMOVE THE OUTER INSULATION OF THE CABLE.



REMOVE 1/4" OF INSULATION FROM THE END OF EACH INNER LEAD. APPLY A SMALL AMOUNT OF SOLDER TO THE BARED WIRE ENDS. THEN CONNECT THE LONGER LEADS TO THE OCTAL PLUG AND THE SHORTER LEADS TO THE OCTAL SOCKET AS FOLLOWS.



PICTORIAL 5

INITIAL TEST AND ADJUSTMENT

NOTE: This Converter was designed for use with the Heathkit SB-300 Receiver, but it can also be used with other receivers that tune the 10 meter band, and provide suitable filament, B+, and AGC voltages. These voltages should be connected to the octal plug of the power cable as follows:

Pin 1 - Filament, 6.3 volts at 815 milliamperes.
Pin 2 - Ground.
Pin 3 - B+, 130 volts at 12.5 milliamperes.
Pin 4 - AGC.
Pin 7 - Ground.

The following adjustments are made with the Converter connected to a Heathkit SB-300 Receiver that is operating, and properly aligned. An 11 megohm input VTVM will be needed for some of these adjustments.

() Set the SB-300 Receiver front panel controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - STBY.
BAND - 28.5
AF GAIN - Fully counterclockwise.
RF GAIN - Fully clockwise.
SLIDE RULE DIAL - ON 1.
CIRCULAR DIAL - ON 0.

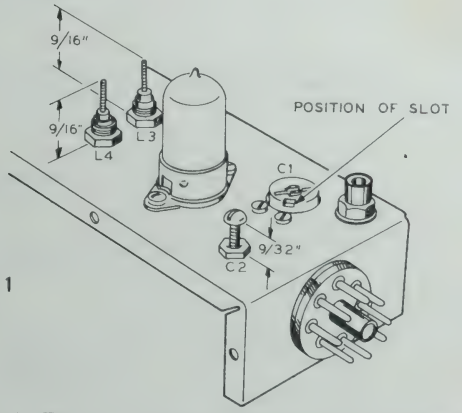


Figure 1

() Referring to Figure 1, preset coils L3 and L4, and capacitors C1 and C2 as shown.

() Connect the power cable prepared previously from the Receiver socket to the Converter plug.

() Set the Receiver Converter switch to VHF No. 2. With the Converter switch in this position, filament and B+ voltage are applied to the Converter. The filaments of the Converter tubes should light.

() If there is any sign of overheating components, turn the Receiver Converter switch to the HF position to remove filament and B+ voltages from the Converter. If no difficulty is encountered, proceed with the following steps.

() Install the tube shields over the Converter tubes.

() Set the Receiver Function switch to OPR (operate).

() Set the VTVM to read -DC volts on the 5 volt or higher range.

() Connect the DC probe of the VTVM to lug 2 of coil F, and connect the common VTVM lead to the Converter chassis.

() Using the alignment tool supplied, adjust oscillator coil L6 for a maximum VTVM reading.

() Disconnect the VTVM test leads from the Converter.

() Using the alignment tool supplied, adjust output coil L5 and the receiver preselector for maximum noise in the speaker.

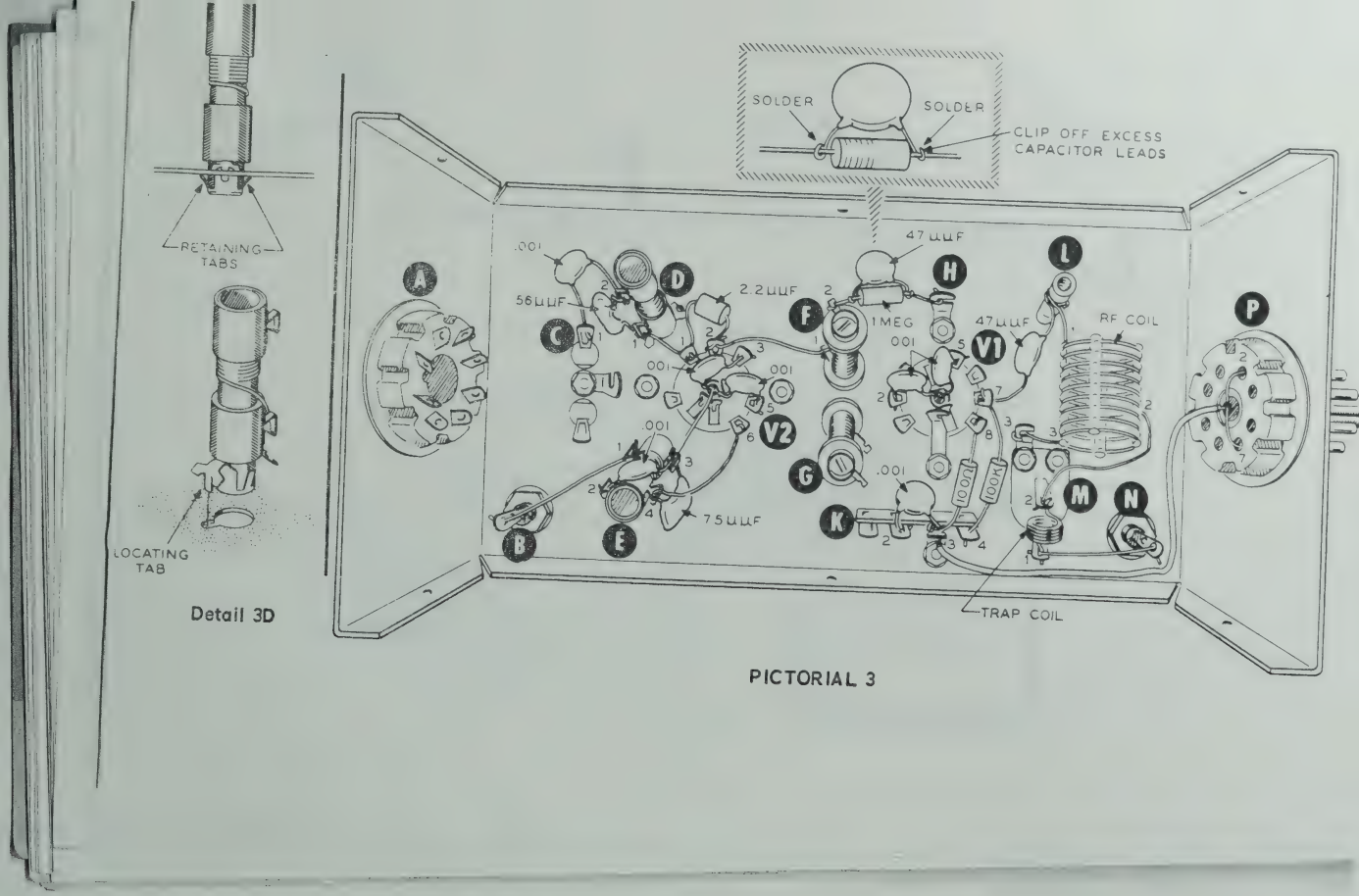
() Set the Receiver Function switch to OFF.

() Disconnect the Converter power cable from the Receiver socket.

This completes the Initial Test And Adjustment of the Converter. Proceed with the Installation section.

INSTALLATION

NOTE: Permanent and Alternate Mounting instructions are given. Use the permanent mounting section if you prefer to have the Converter attached to the rear of your SB-300 Receiver; if you do not want the Converter attached to the Receiver, use the Alternate Mounting section.

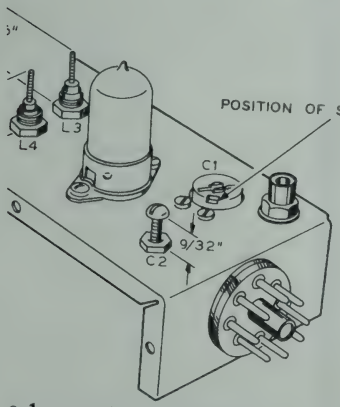


Detail 3D

PICTORIAL 3

HEATHKIT

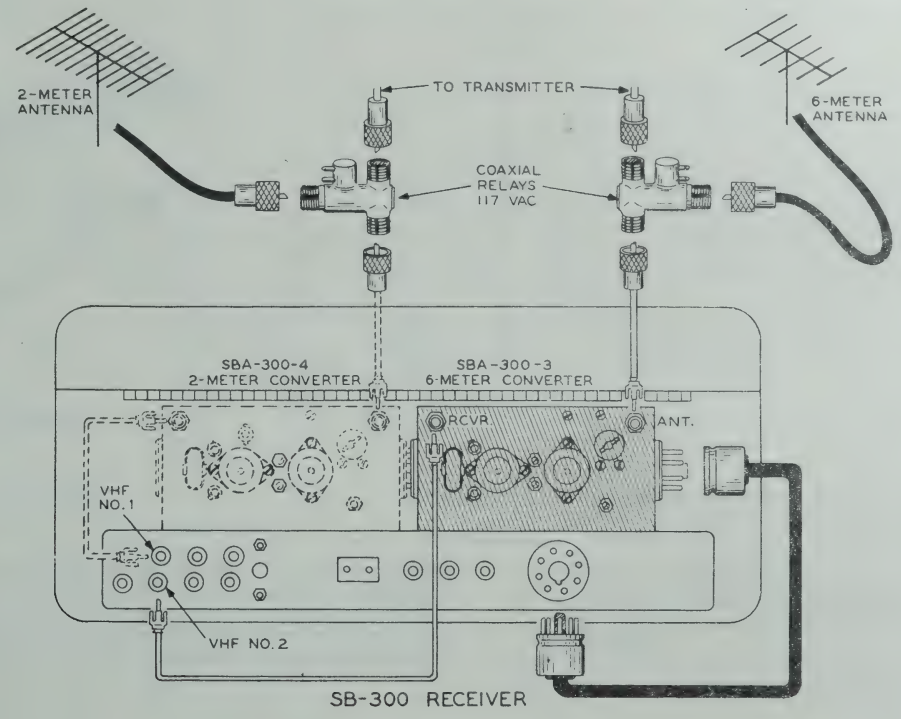
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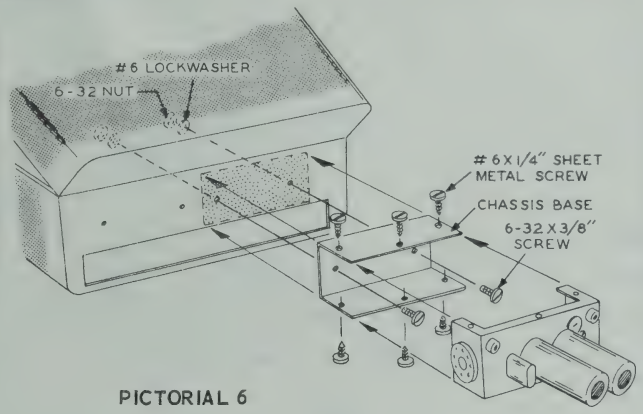
e 1, preset coils L3 and L4, and capac-
shown.

cable prepared previously from the Re-
Converter plug.

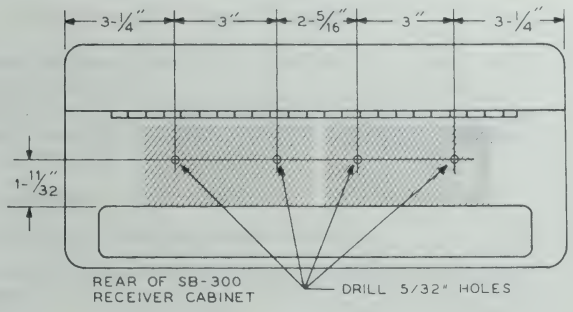
nverter switch to VHF No. 2. With the
this position, filament and B+ voltages
nverter. The filaments of the Converter



PICTORIAL 8



PICTORIAL 6



Detail 6A

PERMANENT MOUNTING

Refer to Pictorial 6 for the following steps.

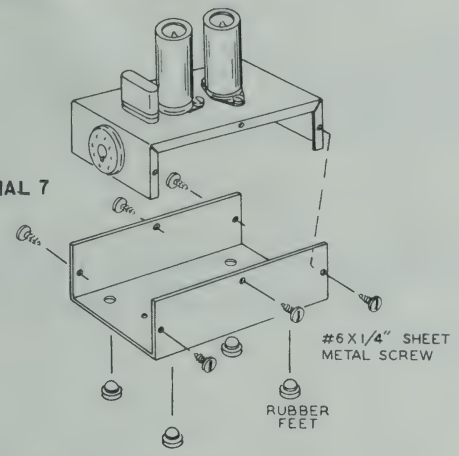
NOTE: Some early model SB-300 Receiver Cabinets do not have holes in the back of the cabinet for the Converter installation. If your cabinet does not have these holes, use Detail 6A to locate and drill the holes needed for the Converter mounting. Be sure to remove the receiver from the cabinet before drilling the holes.

() Install the chassis base to the rear of the receiver cabinet. Use two 6-32 x 3/8" screws, #6 lockwashers, and 6-32 nuts.

() Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

() Install the Receiver chassis into the cabinet.

PICTORIAL 7



ALTERNATE MOUNTING

Refer to Pictorial 7 for the following steps.

() Install the four rubber feet to the bottom of the chassis base.

() Install the chassis to the chassis base, using six #6 x 1/4" sheet metal screws. Make sure the hookup wires are pushed away from the screw holes in the chassis before tightening the screws.

CABLE HOOKUP

Refer to Pictorial 8 for the following steps.

() Connect the power cable from the Converter to the Receiver socket.

() Connect the prepared shielded cable from the RCVR socket of the Converter to the VHF No. 2 socket of the SB-300 Receiver.

() Connect your 6-meter antenna to the ANT socket of the Converter.

OPERATION

TRAP ADJUSTMENT

() Set the SB-300 band switch to 28.0 and tune the receiver to 28.25 (50.25) megacycles. If a spurious signal is heard at or near this frequency (this would be the sound carrier of a channel 2 television station near your locality) turn trap adjustment C1 for minimum signal leakthrough.

ANTENNA TRIMMER ADJUSTMENT

() Adjust trimmer capacitor C2 for the best signal-to-noise ratio when tuned to a weak 6-meter signal.

Instrument alignment should not be required, as the previous adjustments of the coils and capacitors should provide Converter operation equal to, or better than the specifications. In case you have the necessary equipment, and prefer instrument alignment, refer to Pages 25 and 26 of this Manual.

Pictorial 8 shows all the cable connections for using the SBA-300-3, 6-Meter Converter with the SB-300 Receiver. Connections for the SBA-300-4, 2-Meter Converter (available as a separate kit) are shown by dotted lines.

CRYSTAL INFORMATION

The 22 megacycle crystal supplied with the Converter provides reception from 50 to 52 megacycles. Other crystal frequencies can be used to cover different 2-megacycle segments between 48 and 54 megacycles. The following chart lists some of the crystal frequencies that can be used. In each case, the output frequency of the Converter is between 28 and 30 mc, which corresponds to 10 meter reception with the SB-300 Receiver.

CRYSTAL CHART
(Frequencies in megacycles)

CONVERTER CRYSTAL	COVERAGE
20	48 to 50
21	49 to 51
22	50 to 52
23	51 to 53
24	52 to 54

When purchasing a crystal for use with this Converter, you should specify the frequency and the following crystal characteristics. Crystals that do not have these characteristics will not provide optimum performance.

Holder HC-6/U:	Pin diameter .050". Pin spacing .486".
Load capacitance (C1):	12.8 $\mu\mu$f.
Internal capacity (Co):	6 $\mu\mu$f, maximum.
Series resistance (Rs):	30 Ω, maximum.
Drive level:	8 milliwatts.

Also, if you install a crystal other than the 22 megacycle crystal supplied, it will be necessary to readjust oscillator coil L6 as directed in the Test And Adjustment section of the manual.

INSTRUMENT ALIGNMENT

Instrument alignment of the Converter is not required for normal operation; however, if you have access to the necessary test equipment, complete instrument alignment will assure optimum performance. A signal generator that covers 48 to 54 megacycles and a vacuum tube voltmeter will be needed.

() Connect the vacuum tube voltmeter to the speaker terminals of the Receiver. Set the vacuum tube voltmeter to the 1.5 volt AC range.

() Set the SB-300 Receiver controls as follows:

AGC - OFF.
MODE - AM.
FUNCTION - OPR.
RF GAIN - Fully clockwise.
Slide rule dial - 1.
Circular dial - 0.
Converter switch - VHF No. 2.

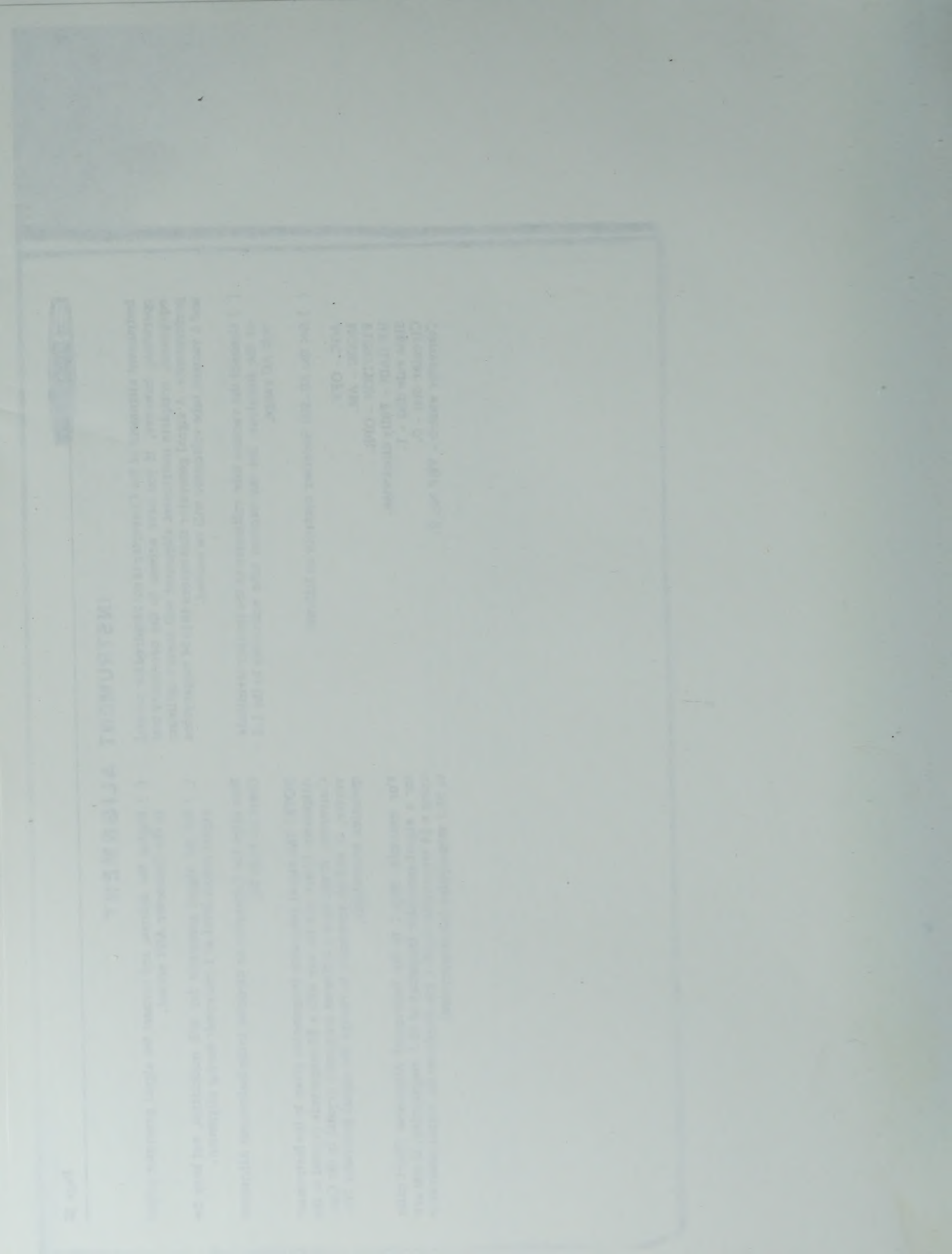
() Unplug the antenna and connect the signal generator output to the Converter ANT socket.

() Set the signal generator for 30% modulation, and keep the signal output level at 1 microvolt during alignment.

Now align the Converter as directed in the Instrument Alignment Chart on Page 26.

NOTE: The signal generator frequencies given in the Instrument Alignment Chart are for use with a 22 megacycle crystal in the Converter. If you have a different frequency crystal in the Converter, it will be necessary to change the signal generator frequencies accordingly.

For example: Step 1 in the Instrument Alignment Chart calls for a signal generator frequency of 51.1 megacycles. If you are using a 24 megacycle crystal, you should set the signal generator to 53.1 megacycles (+2 megacycles).



INSTRUMENT ALIGNMENT CHART

	SB-300 BAND	SB-300 AF GAIN	SB-300 PRE-SELECTOR	SIGNAL GENERATOR (400 cps with 30% modulation)	SB-300 CIRCULAR DIAL	CONVERTER ADJUSTMENTS				
						L5	L6	L3 AND L4	C1	C2
1	29.0 MC	1/2 OF ROTATION	MAXIMUM VTVM READING (NOISE)	51.1 MC	MAXIMUM VTVM READING	MAXIMUM VTVM READING	ADJUST L6 AND SB-300 CIRCULAR DIAL FOR MAXIMUM VTVM READING			
2	28.0 MC	1/2 OF ROTATION	MAXIMUM VTVM READING (NOISE)	50.1 MC	MAXIMUM VTVM READING			ADJUST L4 FOR MAXIMUM VTVM READING	REPEAT THESE TWO ADJUSTMENTS FOR MAXIMUM VTVM READINGS. THESE READINGS SHOULD NOT VARY MORE THAN 5 TO 6 DB BETWEEN THESE TWO FREQUENCY SETTINGS.	
3	29.5 MC	1/2 OF ROTATION	MAXIMUM VTVM READING (NOISE)	51.9 MC	MAXIMUM VTVM READING			ADJUST L3 FOR MAXIMUM VTVM READING		
4	28.0 MC	1/2 OF ROTATION	MAXIMUM VTVM READING (NOISE)	59,75 MC INCREASE SIGNAL GENERATOR OUTPUT	28,25 MC MAXIMUM VTVM READING				ADJUST FOR MINIMUM VTVM READING	
5	28.0 MC			DISCONNECT SIGNAL GENERATOR AND CONNECT ANTENNA	TUNE FOR ON-THE-AIR SIGNAL					ADJUST FOR BEST SIGNAL-TO-NOISE RATIO

INSTRUMENT ALIGNMENT CHART